

Fig. 1), simple blade, orbicular to shallowly 3–5 lobed, without proliferous buds, and with short laminar hairs.

Doryopteris concolor var. *concolor* (Pérez Farrera 442, CHIP, UAMIZ) was collected in the Municipality of Jiquipilas, Cerro Hojas Moradas, 6 km W Rancho Alpes, in the Biosphere Reserve La Sepultura, in tropical deciduous forest, 1300 m altitude (16°20'30"N; 93°42'30"W), in the Sierra Madre of Chiapas. This taxon (Fig. 1) differs from the other species of *Doryopteris* growing in Mexico, *D. palmata* (Willd.) J. Sm., in its free venation, lack of proliferous buds at the base of the blade, and the basically glabrous petiole.

A complete list of the plant species found in the Reserve is in preparation by the junior author.—RAMÓN RIBA (deceased), Universidad Autónoma Metropolitana-Iztapalapa, Ap. Postal 55-535. México, D. F. 09340, and MIGUEL ÁNGEL PÉREZ FARRERA, Instituto de Historia Natural, Depto. de Botánica, Calzada de los Hombres Ilustres s/n, Tuxtla Gutiérrez, Chiapas, México 29000.

Production of Adventitious Buds on the Leaves in *Dicksonia sellowiana*.—

The genus *Dicksonia* L'Her. has been successfully propagated through the culture of spores and gametophytes (Constantino et al., *Memorias del I Congreso Nacional sobre Biodiversidad, Cali, Colombia, Dic. 4-7 1994*, p. 303–308, 1995). No secondary or adventitious budding is known for this genus to date. Evidence is presented here for the first time on the production of foliar (petiolar) adventitious buds in *Dicksonia sellowiana* Hook., and on the feasibility of small scale propagation of the species using these buds.

I have been able to propagate *Dicksonia sellowiana* through the culture of adventitious buds that are naturally produced on the basal parts of the petioles, and which become especially noticeable on the old leaves (Figs. 1–2). Such buds are spontaneously produced in some populations inhabiting the West Cordillera of Colombia, at altitudes between 1900 and 2200 m, between Farallones de Cali and La Cumbre (in Depto. Valle). The species has been considered locally threatened for Colombia, according to Constantino et al. (1995) and Instituto Humboldt-Colombia (*Informe Nacional sobre el Estado de la Biodiversidad*, 1998), mainly due to over-exploitation of stems (for construction) and roots (as a substrate for orchid cultivation), but also as a consequence of land clearing.

Two subpopulations have been carefully observed in Depto. Valle: One at Reserva El Refugio-Torremolinos (Mpio. Dagua, 2000 m alt.), the other one at Reserva Himalaya (Mpio. Bitaco, 2050 m alt.). Both localities are currently being protected by private landowners and are located on the continental divide of the Colombian West Cordillera, slightly towards the Pacific side. Voucher material from El Refugio-Torremolinos has been deposited at FMB (*Calderón-Sáenz 103*).

The buds are produced on the adaxial side of the leaf bases, e.g. on the proximal and widest parts of the petioles. Although barely noticeable on young or even on mature leaves (they are covered by a dense layer of hairs), buds



FIGS. 1–5. Adventitious buds in *Dicksonia sellowiana* and *Alsophila erinacea*. 1) Mature *D. sellowiana* at Reserva El Refugio-Torremolinos showing incipient, petiolar buds. 2) Base of an old, detached leaf of *D. sellowiana* depicting thickened, adventitious buds, prior to germination. 3) Mature *D. sellowiana* at Reserva Himalaya, with sprouting petiolar buds; leaves on the right belong to (petiolar) buds that have adhered to the stem. 4) Incipient adventitious stem buds of *Alsophila erinacea*, in a garden specimen at Reserva El Refugio-Torremolinos. 5) Two year-old *D. sellowiana* obtained through bud propagation and planted at Reserva El Refugio-Torremolinos. Arrows point to petiolar buds in *Dicksonia sellowiana*. Scale bars = 5 cm (Figs. 1–3 and 5) or 1 cm (Fig. 4).

become larger in overmature ones and are able to keep growing, independently, on the old, decaying leaves. In some cases, when decaying leaves remain hanging from the stem, adventitious buds tend to adhere to the latter, giving the impression of stem buds, but actually being petiolar buds (Fig. 3). Cultivation of the buds is relatively simple under nursery conditions if humidity is kept high and constant.

Foliar adventitious buds can be produced at the edges of the lamina in a number of unrelated fern genera (see Tryon & Tryon, *Ferns and allied plants with special reference to tropical America*, 1982). Adventitious buds on the latero-adaxial surface of the leaf bases are already known for a tree fern species, namely *Alsophila polystichoides* H. Christ [also known as *Nephelea polystichoides* (Christ) Tryon], as cited by Gastony (*A revision of the fern genus Nephelea*, Contr. Gray Herb., No. 203, p. 86, 1973).

The position of such buds on the petiole suggests that they represent the first one or two pairs of pinnae, which remain undeveloped or dormant while the leaf is still young. Ontogenically, petiolar buds also resemble the aphlebia of some fern species, like those of *Alsophila capensis* (L.f.) J. Sm. (see Tryon and Tryon, 1982).

Initial observations on the spatial distribution of individuals of *Dicksonia sellowiana* in the cloud forest at Reserva El Refugio-Torremolinos suggested that these buds can play a role in the natural propagation of the species, at least in some local subpopulations living near the continental divide, on top of the West Cordillera of Colombia, between 1900 and 2200 m alt. Other populations of this species inhabiting the cooler, montane belt at 2500–3200 m in Colombia (for example at Laguna de la Cocha, Depto. Nariño, and at the East Cordillera in Depto. Cundinamarca) apparently do not produce any adventitious buds at all.

By comparison, adventitious buds in *Alsophila* are usually formed on the stem, near its base or on the upper parts (Fig. 4). Such stem buds can grow to “diageotropic rhizomes”, and might also play a role in the natural propagation of some populations of *Alsophila*. This is suggested by the ease with which they detach from the mother plant and by the retained capacity to develop into new plants, as exemplified by cultivated specimens of *Alsophila erinacea* (H. Karst.) D.S. Conant at Reserva El Refugio-Torremolinos (unpublished observation).

Is the capability of producing petiolar buds in *Dicksonia sellowiana* genetically determined or is it triggered by environmental conditions? More studies are needed for an adequate answer and for a better understanding of the physiological, reproductive-ecological and phylogenetical implications. In the meantime, several two-year old specimens of *Dicksonia sellowiana* obtained from petiolar buds are growing well at Reserva El Refugio-Torremolinos (Fig. 5). Clearly, bud cultivation is another option for the propagation and conservation of this locally threatened and horticulturally desirable species.

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On the Itineraries of Alfred and Alexander Curt Brade in Costa Rica.—Alexander Curt Brade stayed in Costa Rica with his brother Alfred, between 1908 and 1910, commercially collecting orchids but also preparing herbarium specimens, specially pteridophytes, which later constituted the "Herbarium Costaricense" of A. C. Brade. Duplicate series were initially distributed by Goldschmidt and later (but still in 1908) by Rosenstock as "Filices Costaricenses Exsiccate", indicating "A. & A. C. Brade" as collectors. Alexander kept intensive correspondence with Rosenstock at least up to 1932. His costarican herbarium had 912 pteridophyte specimens representing 502 species of which 60 were described as new, as well as 27 new varieties and 5 forms. The collection is now part of the Herbarium Bradeanum—HB (Rio de Janeiro). Markgraf (Bot. Jahrb. Syst. 93(1): 1–8. 1973) in his biography of A. C. Brade included some facts about his stay in Costa Rica and a general itinerary map. Complementing this information, their field trips during that period and some major events are here presented in more detail.

1908: February 22, A. C. Brade arrives at Puerto Limón.

February 23, train trip to San José.

March 4, Tablazo; 17, La Palma; 26, idem.

April 10, Carpintera; 25, idem.

June 10–14, Farm of Mr. Zent (11, farm in Chiripó; 12, Barmouth Farm—Atlantic coastal region).

July 1, Tablazo; s.d., Guadalupe (Finca de los Padres); 25, Cartago.

August 1, La Palma; 4, Candelaria; 11, Granadilla; 28, Tablazo.

September 8, Irazú; 17, Tablazo; s.d., Carpintera; s.d., Candelaria.

October s.d., La Palma.

November s.d., Tablazo; 25, Carpintera.

December 2, La Palma; 9, San Domingo; 14, La Verbena; 21–23, Tablazo (Finca Haberl.).

1909: January 14, Rio Grande; 21–23, Volcán Barba.

February 1–27, trip to Guanacaste (Orotina, Finca Schild-Burgdorf, Esparta, rio Baranca, Puntarenas, Pitahaya, Isla de Chira, rio Tempisque, Bebedero, Mojica, Miravalles, Aguas Calientes, Mocote).

March 5, La Palma; 12, Candelaria; 20, La Palma.

April 7, Candelaria; s.d., Barba-Poas; May s.d., Orotina; s.d., Finca Schild—Burgdorf (rio Surubres); s.d., Cartago.

June 16–22, Carrillo (La Palma, Honduras).

July 20, Tablazo.

August 5–8, Turrialba; 18, La Palma; 28, Tablazo.